As an initial matter, Petitioners' attempt to concoct a means for modeling special access services does not result in functional services. Paramount among the MSM's shortcomings is the lack of SONET electronics to serve special access lines served out of remote wire centers (VZ-VA Ex. 162 at 9-10) and inadequate investment in digital loop carrier ("DLC") for 4-wire, DS1 and DS3 services. (Tr. at 4397 (Murphy); VZ-VA Ex. 109 at 8.) Specifically, by modeling these special access services as individual POTS lines, the MSM fails to account for the specialized channel units and the extra amount of shelf space and common equipment required by these high-speed services. (VZ-VA Ex. 109 at 27, 41-42.) The MSM also omits the investments for the electronic multiplexing equipment that enables special access DS1 services to function over copper cable and DS3 services to function over coaxial or fiber optic cable. (VZ-VA Ex. 109 at 37.) Absent this equipment, the modeled loop lacks the necessary functionality to deliver DS1 or higher speed services. (VZ-VA Ex. 109 at 37.) Moreover, the MSM fails to account for the requisite fiber optic cables, or coaxial cables, that link customer premises to the network.[146/] (Tr. at 4398 (Murphy).) Without all of these necessary electronics and facilities, the "modeled" special access services simply cannot be functional.

Even if Petitioners' attempted solution could work as an operational matter, the resulting unrealistically inflated line counts used to size the narrowband network create artificial economies of scale, particularly for the *copper* distribution and feeder portion of the loop (Tr. at

---

remedy the underlying flaw associated with the use of DS0 equivalents when sizing the narrowband network. (VZ-VA Ex. 162 at 3-4.)

145/ These incorrect engineering assumptions are discussed in more detail below.

146/ The MSM also produces virtually no additional drop investment as a result of the artificially inflated number of lines, demonstrating yet again that the MSM's assumptions are even internally inconsistent and invalid. (Tr. at 4355 (Tardiff).)

4488-89 (Tardiff)), and are one of the biggest contributors to AT&T/WorldCom's impossibly low loop cost estimates. (VZ-VA Ex. 108 at 28.) The artificial economies of scale in the narrowband network result from the MSM's use of larger capacity cables, remote terminals, and similar equipment to accommodate the special access and high capacity DS0 equivalents. These larger sized facilities have significantly lower per unit costs, producing the artificial economies of scale. (VZ-VA Ex. 109 at 32.) For example, the MSM treats a DS1 special access line as 24 DS0 equivalents and provides for 24 pairs to serve those equivalents, even though a DS1 in a real network would be provisioned using either fiber cable to the customer premises or two dedicated copper pairs. (VZ-VA Ex. 109 at 44.) Because AT&T/WorldCom treat the special access and high capacity DS0 equivalents as though they were demand for ordinary narrowband business lines, AT&T/WorldCom spread these artificial economies of scale across *all* business customer locations and all network elements.

One of the primary results of AT&T/WorldCom's effort to model special access and high capacity demand through the narrowband network is a significant understatement of the cost of the 2-wire copper loop. In particular, by overstating the number of loops, the MSM overbuilds distribution plant — the single largest component of loop cost (Tr. at 4488 (Tardiff)) — by approximately 1.4 million cable pairs, which wrongly increases the number of distribution facilities over which the total loop costs are spread. (Tr. at 4395 (Murphy).) In the case of high-capacity loops, this fundamental error is compounded by rate calculations that, as explained below, prevent Verizon VA from recovering the full costs of the distorted narrowband network

modeled by the MSM. As a result, the MSM's artificial scale economies improperly reduce the costs of *all* loops.[147/]

2. Most of AT&T/WorldCom's Other Proposed Changes Have Been Considered and Rejected by the Commission.

Under the guise of making the Synthesis Model relevant for use in assessing UNE costs, AT&T/WorldCom make various input and algorithmic changes, which collectively operate to produce lower cost estimates. The Commission has already considered and explicitly rejected most of these changes as inappropriate.

For example, the Commission has rejected the so-called "unmodified PRIM algorithm" that AT&T/WorldCom use in the MSM to connect nodes to the central office.[148/] The

---

147/ AT&T/WorldCom's faulty approach to modeling special access and high capacity services has other unfortunate consequences. For example, the MSM as modified by AT&T/WorldCom in surrebuttal excludes two Verizon VA wire centers (corresponding to the CLLI codes MCLNVALV and CNVIVACT) from its UNE cost calculations. (Tr. at 4303-08; VZ-VA Ex. 163 at 20.) As a result, the MSM fails to account for over 400,000 of Mr. Pitkin's forecasted lines. AT&T/WCom Ex. 14; Supporting Workpapers at file: Line Count_Surrebuttal.) Compounding this model error is the fact that the MSM drops an additional 164,000 of Mr. Pitkin's forecasted access lines, which are spread in varying amounts across numerous Verizon VA wire centers. (VZ-VA Ex. 163, file: Sum_missinglines.xls, Row 15, Comparison of HMWK work file to HCPM.mdb input file.) Mr. Pitkin, AT&T/WorldCom's principal cost model witness, was unaware that the purportedly corrected version of his cost model eliminated two wire centers from its calculations. (Tr. at 4308-09.) He speculated that the two wire centers were omitted "[b]ecause line counts were too high" (Tr. at 4429-4430), which is not surprising given AT&T/WorldCom's attempts to convert special access and high capacity demand into DS0 equivalents within the MSM. Although Mr. Pitkin's alleged "quick fix" to this significant model flaw (consisting of a manual override to the MSM's algorithms) resulted in only a $0.01 difference in the loop cost estimate, Mr. Pitkin has not remedied the underlying error, which causes the MSM to design a wholly different network and produce cost estimates for switching and transport UNEs that are completely divorced from reality by excluding the interoffice facility routes and electronics for the missing wire centers, thereby modeling all of the interoffice transport traffic on fewer rings. (VZ-VA Ex. 163 at 20-24.)

148/ The node selection criteria are used by the MSM to find the least-cost solution to attach the reconstructed distribution areas to the central office.

Commission concluded that only a *modified* version of the PRIM algorithm — one based on lowest cost rather than least distance — "provides a good approximation to the way in which real world engineers are likely to design the feeder network, since the network grows naturally from the central office, by adding new nodes on the basis of minimum cost as new communities are established." (AT&T/WCom Ex. 32, Attachment B at 13.) AT&T/WorldCom, however, revert to the *unmodified* PRIM algorithm in the MSM. This is not surprising, given that the unmodified PRIM algorithm significantly underestimates loop costs by failing to account for all of the outside plant input values and code changes relevant to the connection of nodes to the network. (VZ-VA Ex. 109 at 67-68.)

Other coding changes proposed by AT&T/WorldCom that the Commission has already rejected relate to drop terminal orientation, lot size/configuration, residual line allocation, and overlapping microgrids. (AT&T/WCom Ex. 1 at Ex. D.) Only two of AT&T/WorldCom's proposed algorithm changes — both rather innocuous modifications — have been incorporated by the Commission into the recently-released versions of the Synthesis Model.[149/] (VZ-VA Ex. 108 at 33.)

Similarly, AT&T/WorldCom incorporate into the MSM several additional input values and coding changes that the Commission either rejected or intended to deal with in future model proceedings. The rejected input values AT&T/WorldCom hope to resurrect are, among other things, untenable structure sharing inputs,[150/] erroneous plant mix assumptions,[151/] and

---

149/ The two changes that have been incorporated into the recently-released versions of the Synthesis Model are the modifications to the drop dispersion and the input/variables. (*See* VZ-VA Ex. 146 and 147.)

150/ *Tenth Report and Order* at 20261-62 ¶¶ 244 and 247.

151/ *Id.* at 20258-59 ¶¶ 236-38.

understated DLC input values.[152/] In many cases, the Commission explicitly rejected the inputs that Petitioners propose because they were based solely on the opinion of their consultants with no supporting data.[153/] Undeterred, AT&T/WorldCom again propose many of the same inputs in this proceeding and base them solely on the opinion of their consultants. As explained in more detail below, AT&T/WorldCom's proposed input changes are entirely unrealistic and substantially understate UNE costs.

3. AT&T/WorldCom Have Not Properly Substituted Verifiable, Virginia-Specific Data for the Generalized National Data Used in the Synthesis Model.

Despite the Commission's warnings concerning the use of nationwide values for purposes of calculating UNE prices, Petitioners use almost no Verizon VA-specific data in the MSM. Instead, in most cases, AT&T/WorldCom continue to rely on the Commission's nationwide average inputs created for federal universal service purposes or, worse yet, on unsupported adjustments to those nationwide averages (which are designed invariably to produce even lower UNE cost estimates within the MSM). Moreover, none of the MSM's inputs and UNE cost estimates have ever been validated against any network's real-world results.

For example, the original Synthesis Model used nationwide average default values for structure sharing with other utilities. AT&T/WorldCom chose to ignore Verizon VA's extensive experience identifying available structure sharing opportunities in Virginia and instead adjusted the Commission's nationwide values to reflect entirely unrealistic amounts of structure sharing. AT&T/WorldCom's changes to the Commission's default values reduce the total plant

---

152/ *Id.* at 20275 ¶¶ 278-79.

153/ *Id.* at 20208, 20229-30, 20232-33, 20276, ¶¶ 115, 165, 171-172, 281.

investment by $292 million and the statewide average loop cost by $0.92. (VZ-VA Ex. 109 at 95; VZ-VA Ex. 142.)[154/] Moreover, had Petitioners used the actual values for Verizon VA's conduit sharing and pole investment, while keeping the remaining FCC default values (even along with Mr. Pitkin's 40% adjustment for feeder-distribution sharing), their statewide average loop rate would have increased by $1.43. (VZ-VA Ex. 204.)

It is hard to fathom how Petitioners can advocate that such generic, proxy inputs are superior to Verizon VA-specific data. As noted above, AT&T/WorldCom's approach simply ignores the Commission's repeated warnings against the use of its nationwide averages for state or company-specific purposes. Indeed, there is no evidence that the inputs and assumptions reflect the characteristics of *any* functioning network that is capable of providing all services required under the UNE rules while meeting the service quality requirements imposed by the Virginia Commission. (VZ-VA Ex. 109 at 25.)

4. AT&T/WorldCom's Proposed Rate Structure Does Not Allow Verizon VA to Recover the Full Costs of the Network Modeled By The Modified Synthesis Model.

AT&T/WorldCom's proposed rate design is fundamentally flawed and inconsistent with the manner in which the MSM calculates UNE costs. The MSM uses one set of multipliers to calculate DS0 equivalents for high-capacity special access demand to be included in the narrowband network. These DS0 equivalents are then used to calculate the per-DS0 cost of that network. Mr. Pitkin then uses a different, and dramatically smaller, set of multipliers to derive

---

[154/] AT&T/WorldCom's modification of the Synthesis Model's default plant mix value and their significant reduction to the Commission's default DLC hardware inputs are based on nothing more than Mr. Riolo's unsubstantiated opinion — not a single shred of supporting documentation is provided. Just as the Commission previously rejected these values in the universal service docket, it should reject them here.

the rates for high capacity loops from the MSM's per-DS0 costs.[155] (AT&T/WCom Ex. 1 at 25-26.) As a matter of simple arithmetic, this approach effectively ensures that Verizon VA will never be able to recover the full costs of even the hypothetical network modeled by the MSM. (Tr. 4522-25 (Murphy).)

Mr. Pitkin spreads the $36.8 million monthly total loop *costs* over the 5.7 million DS0 equivalents he forecasts and uses to size the simulated network.[156] Of these 5.7 million DS0 equivalents, 1.63 million are for DS1 special access services,[157] a number that reflects a ratio of 24 DS0s per DS1. However, when it comes to the *price* of DS1s, Mr. Pitkin assumes only 4.3 DS0s per DS1. As a result, rather than the $155.52 price (*i.e.*, 24 x $6.48) for a DS1 loop that he would have computed had he used the same 24-to-1 ratio that he applied in spreading costs, Mr. Pitkin arrives at a UNE price of only $27.85 (*i.e.*, 4.3 x $6.48) per DS1 loop. When projected over all the loops in the MSM's simulated network, Mr. Pitkin's inexplicable inconsistency means that Verizon VA will fail to recover on average $8.7 million, or 24%, of the total monthly loop costs that the MSM itself projects.[158]

155/ Dr. Tardiff's supplemental rebuttal testimony explains how Mr. Pitkin's multiples for deriving the costs of high capacity loops are mathematically illogical. Correct multiples would be considerably higher than what Mr. Pitkin has proposed. (*See* VZ-VA Ex. 162 at 5-6.)

156/ The $36.8 million per month represents the MSM's annual total loop cost of $441 million divided by 12. (VZ-VA Ex. 150.) Mr. Pitkin derived his 5.7 million DS0 equivalents (including the DS1 special access equivalents) from data provided by Verizon VA in response to a data request.

157/ The difference between the total DS0 equivalents and switched lines shown on VZ-VA Ex. 150 is 1.85 million. Data contained in Mr. Pitkin's revised Attachment D to his surrebuttal filing indicate that approximately 12% of these are DS0 special access lines, with the remaining 88%, or 1.63 million, consisting of DS1 special access lines. (Tr. at 4297.)

158/ The MSM assumes 68,000 DS1s (1.63 million DS0 equivalents divided by 24). When this number is multiplied by the $127.67 shortfall in the DS1 price Mr. Pitkin proposes (*i.e.*, $155.52 minus $27.85), the result is an $8.7 million total monthly deficit.

C. AT&T/WorldCom Use Incorrect and Internally Inconsistent Inputs and Engineering Assumptions in the Loop Module To Produce Unrealistically Low UNE Loop Costs.

To achieve their implausible statewide average monthly loop rate of $6.48, Petitioners rely on network inputs and engineering and cost assumptions that have no basis in reality.[159/] As a result, while their model produces incredibly low cost estimates, those cost estimates relate to a network that could never be built, could never provision all the services that Verizon VA's network must provide, and certainly could not do so cost effectively or within the service quality limitations imposed by the Virginia Commission. The costs therefore have no economic significance for a TELRIC proceeding.

This outcome is not surprising: although Verizon VA's robust, functional network in Virginia should, at minimum, be a starting place for determining a forward-looking network design to serve the demand in the state, AT&T/WorldCom all but ignore it in proposing the outside plant-related inputs used in the MSM's loop module. Indeed, they seem to operate from the erroneous assumption that, if something already exists, it cannot be included in the forward-looking TELRIC network. AT&T/WorldCom thus effectively redraw a hypothetical network using as their sole guiding principle the reduction of individual cost components, viewing each such reduction in complete isolation and without consideration of any operational realities. The resulting network and associated cost estimates are not just hypothetical, but unsupported and unsound.

Petitioners similarly make price and cost assumptions that are drawn out of thin air. For example, while AT&T admits that its national central office construction cost per square foot is

---

159/ These issues are discussed throughout in Verizon VA's written testimony, including VZ-VA Ex. 109 at 15-113.

[BEGIN AT&T PROPRIETARY] **[END AT&T PROPRIETARY]** (VZ-VA Ex. 109 at 92-93), AT&T/WorldCom inexplicably select values of $75 to $150 per square foot for the MSM. (VZ-VA Ex. 109 at 92.) Petitioners also ignore Verizon VA's costs for virtually all inputs, even though Verizon VA certainly enjoys efficient pricing today given its economies of scale and scope and price cap incentives.

1. The Modified Synthesis Model Uses Inappropriately Inflated Line Counts That Overstate Efficiencies and Understate UNE Loop Costs.

AT&T/WorldCom's inappropriately inflated line counts are one of the biggest causes of the MSM's unrealistically low loop cost estimates. (VZ-VA Ex. 108 at 28.) In fact, reducing Mr. Pitkin's inflated line count from 5.7 million to the 3.7 million narrowband lines existing in Verizon VA's network today[160/] increases the MSM's loop cost estimate by $2.75. (VZ-VA Ex. 204.) As explained above, the use of AT&T/WorldCom's inflated line count numbers produces efficiencies that no real-world carrier responsible for the provision of narrowband and high capacity, broadband services would or could ever enjoy. The cost efficiencies that Petitioners assume into existence turn on their implausible assertion that the costs of broadband services can be modeled simply by pretending that those services (measured in narrowband equivalents) are delivered through a narrowband network. As explained above, all that this faulty assumption produces is an overgrown narrowband network with too many lines for providing narrowband service and *none* of the specialized facilities and equipment necessary to provision the broadband services whose costs are supposedly being modeled.

160/ "[T]he 3.7 [million lines] includes the actual counts by central office of switched and special access lines that are on the narrowband facilities that actually appear in the copper cable plant. But it does [not] include any DS3s or DS1s that are on fiber [because] they are not on the copper plant." (Tr. at 4517 (Gansert).)

AT&T/WorldCom's attempt to correct their line count forecast (by removing 700,000 DS0 equivalents) in response to Verizon VA's criticisms (Tr. at 4297) does not fix the underlying problem of trying to use the MSM to model the costs of UNEs that simply cannot be provided over the narrowband network. As explained above, the use of *any* high capacity DS0 equivalents in the MSM's loop module exaggerates scale economies in the narrowband network, because the MSM treats those equivalents as additional narrowband demand at existing business customer locations. This necessarily underestimates the cost of providing *all* loop UNEs in Virginia.

In addition to creating scale economies that do not exist, Mr. Pitkin's forecasted line counts create other errors in the MSM that lead to a network that cannot physically serve Verizon VA's customers. For example, the MSM produces an average cable drop length of only 27 feet, effectively guaranteeing that numerous housing units and business locations could not be physically connected to the network. (VZ-VA Ex. 142; AT&T/WCom Ex. 122 at 12-8 (identifying the average working pair, *as opposed to per-location*, drop length as 73 feet).) This average drop length is less than half of the average drop length per working line produced using the default inputs and less than half of that produced by the HAI Model filed by AT&T in the ongoing Massachusetts UNE proceeding.[161/] (VZ-VA Ex. 109 at 105.)

[161/] One of the principle reasons the MSM is incapable of accurately calculating a sufficient amount of drop length is because the MSM models a fixed drop investment per foot to a hypothetical, static number of customer locations. As a result, when AT&T/WorldCom inflate the number of lines, but the number of customer locations does not increase, the total drop investment virtually does not change. Indeed, as Dr. Tardiff stated, because the Model "measures where the drop might be with respect to where *hypothetically* the network equipment is placed or [where *hypothetically*] customer locations are located," the MSM does not calculate an adequate quantity of drop. (Tr. at 4355-56 (emphasis added).) The MSM's failure to produce additional drop investment demonstrates, yet again, that the MSM's assumptions are even internally inconsistent and invalid.

Mr. Pitkin's forecasted line counts also cause the MSM to produce overall feeder lengths that are inefficiently short and distribution lengths that are impossibly small. Efficient engineering practices call for maximizing the length of feeder facilities in the local loop and reducing the length of more costly and less highly utilized distribution facilities. (VZ-VA Ex. 109 at 24.) With Mr. Pitkin's forecasted line counts, the MSM models a network that ignores this widely-accepted practice and contains an unrealistically small amount of feeder facilities. Although in the real world, shorter feeder facilities obviously require longer distribution facilities, the MSM ignores this necessity and produces impossibly undersized distribution facilities when using Mr. Pitkin's forecasted line counts. (VZ-VA Ex. 109 at 24-25.) The MSM produces distribution lengths that are, in some instances, less than the *minimum* distance between the customer being connected and the Verizon VA central office.[162/] (VZ-VA Ex. 108 at 45.) These impossibly short distribution cable lengths result in understated distribution cable investment, support structure investments (*e.g.*, poles, manholes, trenches, conduits, and pull boxes), and maintenance costs, to name but a few. But more important, the understatement of both feeder and distribution produce a network that simply is not designed to be able to actually reach and serve the customers it is required to serve.

The problems associated with Mr. Pitkin's line counts are only exacerbated by his failure to augment the customer locations in the modeled network to accommodate his inflated line counts. Mr. Pitkin relies on projected 2002 line counts, yet assumes that these increased lines

---

162/ In his surrebuttal testimony, Mr. Pitkin attempts to make the MSM's distances appear reasonable by inappropriately adding drop distances to distribution distances. (AT&T/WCom Ex. 14 at 39.) Adding drop distances is only appropriate when customer locations are set back from roads (*see* AT&T and MCI *Ex Parte*, CC Docket No. 96-45, "HAI Model v.5.0a, Why It Engineers the Appropriate Amount of Distribution Plant," at 17-18 (June 10, 1998)), which is not the case for the customer location data used in the MSM.

will be provisioned to the number of customer locations present in 1997. As a result, every additional line is assumed to be a second line, producing a wholly unrealistic and completely unsubstantiated rate of secondary line growth.[163/] (Tr. at 4401-02 (Murphy); VZ-VA Ex. 109 at 116-117; VZ-VA Ex. 108 at 30.) In addition, because the customer locations modeled remain static, an increase in lines results in an unrealistic increase in the amount of shared resources and unattainable economies of scale.

Short of reprogramming the MSM to account properly for all of the specific facilities and electronics needed to provision high capacity services, the only solution to these problems is to remove the DS0 equivalents representing high capacity services from the projected line counts used in the MSM. Indeed, removing the high capacity DS0 equivalents causes the MSM to model a network with more reasonable route lengths, as Mr. Gansert noted during the hearing. (Tr. at 4350.) Notably, however, correcting this error would leave the MSM even less capable of calculating the TELRIC costs of providing high capacity services. (Tr. at 4133-34 (Murphy); VZ-VA Ex. 109 at 29-38.)

2. The Modified Synthesis Model's Structure Sharing Inputs Are Based upon Unrealistic Efficiencies and Assume Sharing Opportunities That Could Never Be Realized in the Real World.

The Modified Synthesis Model's structure sharing inputs are based on efficiencies that, as described in detail above in Part IV, are unattainable in practice. As noted above, Petitioners ignored Verizon VA's structure sharing experience in Virginia and rejected even the Commission's nationwide sharing values. Instead, Petitioners propose inputs that reflect wholly unrealistic amounts of structure sharing based on their view of what the future might be like — a

163/ In fact, compared to the Synthesis Model, the MSM incrases secondary residential lines by 240,409, but *decreases* primary lines by 19,318. (VZ-VA Ex. 109 at 117 (Table 6).)

future in which *all* networks, including those of all utility and cable service providers, are rebuilt simultaneously, so that each of these entities would be ready and willing to share structure costs with the MSM's hypothetical new entrant. (*See* Tr. at 3225 (Tardiff).) The MSM thus fails to reflect the variety of real-world factors that limit sharing opportunities for Verizon VA and other efficient, real-world carriers. (VZ-VA Ex. 109 at 96.)

For example, despite the fact that there are very few actual conduit trench sharing opportunities in Virginia,[164/] AT&T/WorldCom arbitrarily propose a conduit sharing factor of 50%. (AT&T/WCom Ex. 12 at 78.) But, as Mr. Gansert explained, a third party would be "irrational" to share Verizon VA's cost of placing conduit, because most third parties are already entitled to lease spare ducts from Verizon VA at heavily discounted rates that are far less than a proportionate share of the true structure placement costs. (Tr. at 4387.) Petitioners have no answer for this, nor any explicable reason why, even in the hypothetical future world they envision, Verizon VA or any carrier would expect to enjoy more sharing than Verizon VA has in the past. Certainly sharing — which reduces costs — is something that Verizon VA would always have had an incentive to pursue, if such opportunities in fact existed.

AT&T/WorldCom's proposed structure sharing factor of 33% for all buried cable (*i.e.*, assuming that Verizon VA is responsible for only 33% of the cost) is similarly unjustifiable. It ignores the FCC's default values for buried cable structure sharing (which range from 55% to 100%) and Verizon VA's actual underground cable investment data, which already reflect Verizon VA's achieved sharing opportunities. (*See* AT&T/WCom Ex. 23, Attachment G at 14;

[164/] *See* VZ-VA Ex. 122 at 146 (noting "only limited opportunities to share trenching costs" in Virginia); Tr. at 4382-83 (Murphy) (noting that Verizon VA's cost studies attributed 97% of conduit investment to Verizon because there is "virtually no [current] sharing of conduit systems").

VZ-VA Ex. 109 at 97; VZ-VA Ex. 122 at 146; Tr. at 4380 (Gansert); s*ee also Tenth Report and Order* at 20260-61 ¶ 243.) AT&T/WorldCom further increase their already inflated inputs for feeder structure sharing (which in turn reduces feeder structure investment within the model) by an additional 40% based on the completely speculative assumption that in the Virginia network, 40% of all feeder routes would or should share structure with distribution cable. (AT&T/WCom Ex. 1 at 19; AT&T/WCom Ex. 6 at 11-12.) AT&T/WorldCom provide no evidence in support of these proposed inputs, and their witness Mr. Riolo conceded that he did not even know whether AT&T or WorldCom experienced the level of structure sharing opportunities that he postulated.[165/] (Tr. at 4547.)

The Commission already has rejected AT&T/WorldCom's proposed structure sharing changes and should do so again.[166/] These changes are based on nothing more than the unsubstantiated speculation of AT&T/WorldCom's witnesses and the HAI Model developers. (*See* VZ-VA Ex. 109 at 95; AT&T/WCom Ex. 18 at 15-18; AT&T/WCom Ex. 12 at 76-78.) Indeed, as Verizon VA explained above, AT&T/WorldCom's proposed structure sharing inputs reflect wholly unrealistic assumptions about achievable structure sharing opportunities. Inexplicably, the MSM assumes that conduit and manholes can be shared with other utilities.[167/] Compounding these significant modeling flaws is the MSM's failure to account for either the costs of the structure necessary to accommodate the sharing of facilities with other utilities, or

---

165/ One day before the filing of this brief, Petitioners still had not responded to the Commission's record request concerning the extent to which Petitioners had experienced structure sharing opportunities.

166/ *See Tenth Report and Order* at 104, ¶ 241.

167/ In contrast, the HAI Model documentation, Appendix B - Structure Shares Assigned to Incumbent Local Telephone Companies, notes that sharing is appropriate only for trenches, not for conduit or manholes. (*See also* VZ-VA Ex. 107 at 78-79.)

the costs of building structures that reflect the operating realities in Virginia. (*See* VZ-VA Ex. 109 at 94-96.) In the end, as noted above, AT&T/WorldCom's changes just to the Commission's default structure sharing assumptions (which themselves are too high) have the effect of reducing the total plant investment by $292 million and the statewide average loop cost by $0.92. (VZ-VA Ex. 109 at 95; VZ-VA Ex. 142; VZ-VA Ex. 204.)

3. The Modified Synthesis Model Assumes a Plant Mix That Is Completely Arbitrary and Would Never Exist in the Real World.

The MSM arbitrarily assumes a plant mix that cannot be achieved in Virginia on a forward-looking basis. By assuming away the constraints faced by providers operating in the real world, and incorporating unrealistic amounts of structure types the costs of which Petitioners have artificially deflated, AT&T/WorldCom have manipulated the MSM to lower its already understated outside plant cost estimates. What AT&T/WorldCom lose in the process, however, is any connection to reality. It should come as no surprise that AT&T/WorldCom's unjustified "modifications" to the Commission's default plant mix inputs reduce plant investment by $291 million and decrease the Synthesis Model's loop costs by $0.54. (VZ-VA Ex. 142.) Had Petitioners used Verizon VA's plant mix assumptions, the monthly statewide average loop cost would have increased by $0.91. (VZ-VA Ex. 204.)

Paramount among the problems associated with the Modified Synthesis Model's unrealistic plant mix assumptions is the failure to take into account, on an area-specific basis, factors such as existing structures, municipal ordinance requirements, the specific location of rights-of-way, potential roadside hazards, local weather, and the fact that other facilities may already use particular types of structure in an area where new cable is being placed. (VZ-VA Ex. 109 at 109.) All of these factors are critical to determining the appropriate structure type in a particular area and, hence, the proper mix of outside plant. Instead of taking these factors into

account, AT&T/WorldCom claim, without any explanation or empirical analysis, to have "transformed" statewide ARMIS data into plant mix values that vary by density zone. (AT&T/WCom Ex. 6 at 40.) This overly simplistic approach does not, and could not, be expected to result in meaningful estimates of the specific structures that are necessary to serve the over 3.7 million narrowband lines in Verizon VA's territory.

AT&T/WorldCom's inputs reflect unrealistic assumptions concerning the types of facilities that would be deployed throughout the hypothetical network. For example, the MSM substantially understates the amount of underground facilities that could reasonably be expected to exist in Virginia. This understatement is not surprising given that underground facilities are the most expensive to install,[168/] but it ignores the fact that underground cable must be used in certain locations (such as under busy streets) to avoid the need for repeated excavations.

Finally, the dominant structure type in the network Petitioner's model — buried cable[169/] — is the structure type for which they posit the most sharing. The MSM assumes a buried cable sharing factor of 33%, which assumes three-way sharing of trenches throughout Virginia. (AT&T/WCom Ex. 12 at 77-78.) This assumption reduces the costs of buried cable to an implausible level.[170/] AT&T/WorldCom's speculative and unsupported plant mix inputs (assuming 40-50% buried cable), working in tandem with their wholly unrealistic structure

---

168/ The costs associated with underground facilities include costs for excavation, restoration, and structure such as conduits and manholes. (VZ-VA Ex. 107 at 28, 79.)

169/ Buried cable accounts for more than half of all distribution and copper feeder cable and 40% of all fiber feeder in six of the MSM's nine density zones. (AT&T/WCom Ex. 14, Accompanying Workpapers at file "VA_Direct_Inputs.xls," at tabs "DISTRMIX," "CuFDRMIX," and "FiFDRMIX.")

170/ Furthermore, in making the changes for buried structure sharing, Mr. Riolo makes no attempt to adjust the values to reflect lower sharing opportunities with buried feeder structure, consistent with the HAI Model values upon which he relied. (VZ-VA Ex. 109 at 95.)

sharing inputs (with Verizon VA responsible for only one-third of the cost of burying the cable), further understate the MSM's loop cost estimates and should be rejected. In reality, no carrier, no matter how forward-looking the environment, would be able to operate efficiently, if at all, utilizing the plant mix produced by the MSM.

4. AT&T/WorldCom's Proposed Fill Factors in the MSM Are Unreasonably High.

AT&T/WorldCom's proposed target fill factors in the MSM would not allow Verizon VA or any other carrier to operate a network efficiently and meet the service quality standards imposed by the Virginia Commission. As explained above in Part IV, an efficient local exchange network must be designed to include sufficient amounts of spare capacity to accommodate administrative and maintenance needs, demand fluctuations, and, for some types of plant, future growth. Moreover, the realities of operating a real network produce additional spare capacity. For example, accepted planning standards and guidelines for building efficient distribution facilities require building two or more pairs per subscriber location to provide the requisite capacity to service the demand. (*See, e.g.*, VZ-VA Ex. 109 at 21-22.) The MSM's target fill factors fail to take these considerations into account, and, as a result, model a network that could not be operated efficiently, if at all.

The most egregious examples of AT&T/WorldCom's unreasonably high proposed fill factors are for fiber strand and distribution cable.[171/] For fiber strand, as noted in Part IV, AT&T/WorldCom use a 100% fill factor. As Mr. Gansert explained during the hearing, it "just patently defies common sense" to assume that it would even be possible, much less efficient, to

---

171/ The MSM is unable to provide the requisite information to determine its effective fill factors in the first instance. (Tr. at 4190 (Tardiff).) To overcome this inherent shortcoming, AT&T/WorldCom offer a dubious fill factor calculation based on the number of working lines.

build a fiber network that was sized perfectly to meet all demand, now and forever, with no spare fibers available for any purposes. (Tr. at 4502.)

Petitioners' proposed distribution fill factor is not much better. Though AT&T/WorldCom claim that their target fill factor for distribution produces an actual fill of 52.5%, Mr. Pitkin's calculation of that number was based upon an incorrect ratio of mid-2001 working lines to the end-of-year 2002 capacity he estimates that the MSM produces.[172] (AT&T/WCom Ex. 14 at 14 n.15.) The correct comparison of line counts and capacity at the same point in time would produce a fill factor of 64.3%. Further, given the way in which Petitioners calculate fill factors based on Mr. Pitkin's line counts, if line counts are assumed to continue to grow at the rate that Mr. Pitkin suggests,[173] then the static network modeled by the MSM would have to operate with a distribution fill factor of almost 100% in 2004 and would overload in 2005. (VZ-VA Ex. 108 at 29.)

The other fill factors proposed by AT&T/WorldCom also fail to provide for reasonable levels of spare capacity that would exist in an efficiently designed and operated forward-looking network for all of the reasons discussed in Part IV above. Indeed, Mr. Riolo acknowledged that he was unaware of *any* local exchange network that operates at the levels of AT&T/WorldCom's proposed fills. (Tr. at 4513-15.)

---

[172] Mr. Pitkin's surrebuttal testimony identifies the capacity produced by the Model and the 2001 lines counts. (AT&T/WCom Ex. 14 at 16.) The 2002 line counts used in Mr. Pitkin's direct testimony are identified in Attachment H to the July 2, 2001 cost study filing. (AT&T/WCom Ex. 23.)

[173] Using Mr. Pitkin's forecasted growth rates, the MSM would have to serve a projected 10.2 million access lines in 2004. (VZ-VA Ex. 108 at 29.)

5. AT&T/WorldCom Use Understated and Unverified Investment Inputs in the MSM's Loop Module.

AT&T/WorldCom use numerous understated investment inputs in the MSM's loop module, contributing to the MSM's understatement of the TELRIC costs for loops. For example, AT&T/WorldCom propose a per pole investment of approximately $417 but provide absolutely no data showing that value to be reasonable in any jurisdiction, much less in Virginia. (VZ-VA Ex. 108 at 42.) Indeed, Verizon VA's extensive experience installing poles in Virginia shows that the actual investment (in current dollars) per pole is 217% greater than that produced by the MSM. (VZ-VA Ex. 108 at 41-42.)

Similarly, AT&T/WorldCom propose DLC investment inputs that are significantly lower than the Commission's default DLC hardware inputs — values that were at least based on empirical average data compiled by the Commission. The sole basis for Petitioners' proposed DLC inputs is Mr. Riolo's unsubstantiated opinion. (AT&T/WCom Ex. 6 at 19-20.) Without factual documentation, however, relying on Mr. Riolo's judgment is wholly inappropriate, particularly given that AT&T/WorldCom have been provided Verizon VA's current, highly discounted DLC costs that reflect the benefits of Verizon VA's substantial purchasing power.[174/] AT&T/WorldCom's significant, unjustified reduction to the Commission's default DLC hardware inputs reduces outside plant investment by $78.3 million and depresses loop costs by $0.25, as compared to the original Synthesis Model's values. (VZ-VA Ex. 109 at 14; VZ-VA

[174/] Mr. Riolo's attempt in his Surrebuttal Testimony to compare his proposed DLC inputs to Verizon's DLC contract prices (AT&T/WCom Ex. 18 at 13-14) is misleading. As Mr. Riolo acknowledges in his Direct Testimony, his DLC investment inputs are intended to include installation costs. (AT&T/WCom Ex. 6 at 19-20.) Verizon's DLC contract prices, by contrast, are materials-only prices that do not include any installation costs.

Ex. 142.) And importing Verizon's DLC prices into the MSM increases the monthly statewide average loop cost by $0.39. (VZ-VA Ex. 204.)

Moreover, when they do rely on the Synthesis Model's default inputs, AT&T/WorldCom manage to pick low-cost inputs even when the facts demonstrate that those inputs are unreasonable. For example, AT&T/WorldCom conveniently forego using *less* current values for those costs of loop components that have been increasing over time — *e.g.,* copper cable, labor, and outside plant structure. (VZ-VA Ex. 109 at 81-82; VZ-VA Ex. 108 at 43.) Instead, AT&T/WorldCom use the default input prices for these assets, which are based on 1997 nationwide levels, thereby understating the forward-looking costs of those loop components. This "oversight" stands in stark contrast to their treatment of switching prices: while switching equipment prices generally have decreased over time, AT&T/WorldCom utilize more current switching costs (1999) when estimating these UNE rates. (*See* VZ-VA Ex. 109 at 80-81; *Tenth Report and Order* at 20412-15, Appendix C.) Ironically, WorldCom itself recognized in its brief before the Supreme Court that switching equipment is characterized by declining costs, "while loop costs are 'increasing.'"[175/]

AT&T/WorldCom also use an unreasonably low figure for power and main distribution frame investment, which has been rejected by the very company responsible for generating the data upon which the figure is based. Technology Futures Inc. has stated unequivocally that the Commission misapplied its study in adopting the Synthesis Model, and thus the actual investment for power and main distribution frames should be substantially higher than the estimates used in the MSM. (VZ-VA Ex. 163 at Attachment 4.) Although Petitioners claim to

---

[175/] WorldCom Reply Brief at 6.

"correct" the Synthesis Model in other respects, they do not "correct" for this data, apparently because this correction would have caused the MSM's cost estimates to increase.

6. The Modified Synthesis Model Uses Customer Location Data That Cannot Be Verified by the Commission or the Parties to this Proceeding and that Fails to Account for Vacant Customer Locations.

A critical factor in determining the cost of providing service is the location of the customers to be served. The customer location data used in the Modified Synthesis Model is based on proprietary pre-processing data and algorithms assembled and derived from a variety of source data by Taylor Nelson Sofres ("TNS"), the most recent of which is of 1997 vintage. (VZ-VA Ex. 109 at 116, 118.) TNS will not even allow the Commission, Verizon, AT&T/WorldCom, state commissions, or their consultants sufficient access to perform a meaningful review of the actual data or the processes TNS uses to convert the data into customer locations. Thus, it is difficult even to evaluate the logic of the customer locations used by Petitioners.

It is clear, however, that the MSM takes an unrealistic approach to building outside plant to customer locations. The MSM does not build outside plant to residential and business units that are vacant pending rental turnover, real estate transfer, or to known new construction sites.[176/] (VZ-VA Ex. 109 at 23.) Yet clearly such locations are likely to need outside plant in the near if not immediate future. Assuming away the plant that would be necessary to serve them is entirely absurd and, in the real world, would be grossly inefficient. A network designed

---

176/ There is absolutely no quantitative or documented support for AT&T/WorldCom's claim that the TNS data includes some unoccupied housing units (which are accounted for in Verizon's model through its utilization factors) (VZ-VA Ex. 109 at 23 n.27, *see also Tenth Report and Order* at 20183-84 ¶¶ 56-57.). AT&T/WorldCom have not provided any record evidence to suggest that vacant housing units allegedly are included in the Metromail mailing list. In fact, it is highly unlikely that the Metromail database would send mailings to vacant customer locations.

in that way would be incapable of meeting the service quality standards mandated by the Virginia Commission (VZ-VA Ex. 109 at 25) and would not comply with the service standards and nondiscrimination principle established by the Commission in its *UNE Remand Order*[177] and *First Report and Order*,[178] respectively. For example, the inefficient plant designed by the MSM would not allow Verizon VA to meet the Virginia Commission's requirement that certain orders be completed within five working days, and would make it impossible for Verizon VA to comply with the Commission's requirement that ILECs provision UNEs under terms and conditions essentially equivalent to those under which the ILEC provisions to itself.

7. The Modified Synthesis Model's Unrealistic Engineering Assumptions Design a Network Incapable of Provisioning Unbundled, Fiber-Fed Loops.

The MSM's provisioning of fiber-fed DLC loops is based upon engineering feats that have not been achieved in the real world — a fact recognized by AT&T/WorldCom. (Tr. at 4619.) Although, as noted in Part IV above, the MSM actually uses more copper than Verizon VA's forward-looking model posits, where it does use fiber-fed DLC loops, the MSM assumes that those loops can be provisioned using the GR-303 integrated digital loop carrier ("IDLC") switch interface. (AT&T/WCom Ex. 6 at 19-20.) As explained in detail in Part IV above, this assumption simply does not accord with the reality of currently available — or even foreseeable — technology. And even if Verizon VA could somehow develop or purchase the necessary DLC equipment, OSS, and switch interfaces to support GR-303 loop unbundling, the MSM does

---

177/ Third Report and Order and Fourth Further Notice of Proposed Rulemaking, *In re Implementation of the Local Competition Provisions of the Telecommunications Act of 1996*, 15 FCC Rcd. 3696 (1999) ("*UNE Remand Order*").

178/ *Local Competition Order* at 15656 ¶ 307.

not include all of the costs Verizon VA would have to incur to develop and deploy those capabilities. (VZ-VA Ex. 109 at 27.)

8. The MSM's Failure to Adhere to Widely-Accepted Engineering Standards Produces Inaccurate and Unrealistic Outside Plant Cost Estimates.

The methodology used by the MSM to size distribution areas and locate customers in the network fails to adhere to recognized engineering standards. As a result, the MSM produces understated distribution investments and models a network that is incapable of providing required services. The MSM completely ignores well-established outside plant design principles, which typically size serving areas at 200 to 600 living units. (VZ-VA Ex. 109 at 28; VZ-VA Ex. 142.) The MSM's inefficient and inappropriate outside plant design causes the MSM to model a network in which 24.8% of the serving areas exceed 600 living units. (VZ-VA Ex. 109 at 28; VZ-VA Ex. 142.) Moreover, by relying on dubious and unproven loop design standards, the MSM produces unrealistically large distribution areas, thereby modeling only half as many distribution areas as exist in Verizon VA's network today. (VZ-VA Ex. 109 at 28-29.) These frequently oversized serving areas violate basic economic principles and widely-accepted engineering practices and produce understated loop cost estimates that could never sustain the network operations of an efficient carrier in the real world. (VZ-VA Ex. 109 at 28-29.)

The MSM also fails to adhere to Carrier Serving Area standards, which limit the use of copper loops to 12,000 feet beyond the feeder/distribution interface in most areas. By ignoring this standard, the Modified Synthesis Model introduces unnecessary inefficiencies and designs loop plant that is likely to be incapable of supporting the wide range of data services currently available over basic loops (*e.g.*, a modem speed greater than 28.8 kbps, ISDN, and DDS). (VZ-

VA Ex. 109 at 19.) At bottom, these and other modeling flaws result in loop estimates that are substantially understated.

9. AT&T/WorldCom Have Provided No Virginia-Specific Evidence to Justify Adjusting the MSM's Road Factor.

The Modified Synthesis Model's road factor is based upon data that lacks any nexus to Virginia and thus is wholly inappropriate for use in this proceeding. The MSM's road factor, which AT&T/WorldCom reduced from the default value of 1.0 to 0.9, is inappropriately based upon a BellSouth cost model and an order of the Kansas Public Service Commission, neither of which reflect Virginia-specific conditions.[179/] (AT&T/WCom Ex. 1 at 21-22.) Had AT&T/WorldCom correctly relied upon Virginia-specific data, the road factor would have been increased, not decreased. (VZ-VA Ex. 109 at 104.)

AT&T/WorldCom, however, never conducted an empirical analysis that was Virginia-specific, as Verizon VA witness Mr. Murphy has done (Tr. at 4415), notwithstanding that MSM's own documentation calls for an empirical study of the particular region and specific company when a departure from the default values is proposed. (Tr. at 4414.) Petitioners justify their reduction of the road factor by pointing to an empirical analysis of 14 rural *Kansas* wire centers. Clearly, the results of any such study would have little applicability to a Verizon VA-specific analysis. AT&T/WorldCom go on to claim that their road factor reduction is

---

[179/] In addition, the Kansas Order was based on a version of the FCC's Synthesis Model that did not include Mr. Pitkin's coding changes. Because those changes *reduce* the route distances produced by the model, it is all the more inappropriate to apply the road factor reduction in this proceeding based on an analysis of results produced without those changes. (VZ-VA Ex. 108 at 32.)

appropriate because Verizon VA is over lashing[180/] — an erroneous assumption that allows them to further understate the amount of outside plant required for Verizon VA's network. What AT&T/WorldCom conveniently ignore, however, is that distribution facilities are generally built to specific sizing factors at the time of installation, with no intention of augmentation; only on rare occasions is it necessary to overlay further distribution on an existing route. Furthermore, Mr. Pitkin's claim — that the road factor must be reduced because the MSM's use of surrogate customer location data artificially overstates dispersion (AT&T/WCom Ex. 1 at 21) — has already been considered and rejected by the Commission.[181/]

Predictably, Mr. Pitkin's reduction of the default distribution road factor in his surrebuttal filing depresses plant investment by more than $106.7 million and loop cost by $0.34, as compared to the original Synthesis Model's values. (VZ-VA Ex. 142; VZ-VA Ex. 109 at 103.)

D. AT&T/WorldCom's Approach to Calculating Expense and Support Investment Ratios Systematically Understates UNE Costs.

AT&T/WorldCom's approach to estimating expense and support investment ratios produces systematically understated UNE cost estimates by failing to correct for mismatches between the investments used to develop the ratios and the investment levels to which the ratios are applied.[182/] AT&T/WorldCom also exclude entire categories of expenses and support

---

180/ Overlashing occurs when a new aerial cable is attached to an existing aerial cable rather than being placed separately on a pole.

181/ *Tenth Report and Order* at 20179 ¶ 46 ("In the absence of a reliable source of actual customer locations by which to compare the surrogate locations, it is impossible to substantiate AT&T and MCI's contention that the road surrogate algorithm overstates the dispersion of customer locations in comparison to actual locations.").

182/ This issue is addressed throughout Verizon VA's testimony, including VZ-VA Ex. 109 at 10-15 and VZ-VA Ex. 108 at 7-12.